

ABSTRACT

The present invention relates to a method of forming a copper wiring in a semiconductor device. A copper wiring is formed within a damascene pattern. Before a copper anti-diffusion insulating film is formed on the entire structure, a specific metal element is doped into the surface of the copper wiring and the surface of its surrounding insulating film to form a metal element-doping layer. The doped specific metal element reacts with surrounding other elements, due to heat upon depositing the copper anti-diffusion insulating film and a low dielectric constant interlayer insulating film and additional annealing process. For this reason, a copper alloy layer and a metal oxide layer are stacked at the interface of the copper wiring and the copper anti-diffusion insulating film and the metal oxide layer is formed at the interface of the insulating film and the copper anti-diffusion insulating film. The interfacial bondability between the copper anti-diffusion insulating film and each of the copper wiring and the insulating film underlying the insulating film is increased to improve reliability of the wiring.